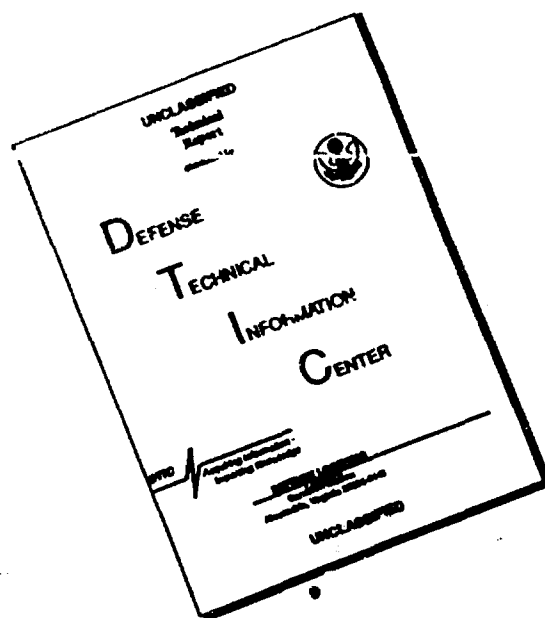


DISCLAIMER NOTICE



**THIS DOCUMENT IS BEST
QUALITY AVAILABLE. THE COPY
FURNISHED TO DTIC CONTAINED
A SIGNIFICANT NUMBER OF
PAGES WHICH DO NOT
REPRODUCE LEGIBLY.**



FINAL REPORT, N00014-90-J-4009
"Fabrication of a NAVMAP, a Deep-Sea Mapping System"
Alexander Shor, Principal Investigator
University of Hawaii at Manoa

S

DTIC
ELECTE
AUG 30 1993

E

D

Grant N00014-90-J-4009 was provided as the initial (FY1990) funding of a larger project to develop and build a deep-sea mapping sonar system, which was to be operated on delivery by the Naval Oceanographic Office (Code OW). Intended as the first increment of a multi-part grant, it was decided in 1991 by the ONR Contracts and Grants Office that the second and subsequent funding increments were to be carried out on a contract rather than grant basis, and thus the present grant was allowed to expire in 1991 and a contract was initiated to complete the project. The description here is of the successful completion of development efforts under the grant component of the effort; the contract effort continues as of this date (6/93), with the principal deliverables completed, tested and delivered to NAVOCEANO for operation, but some portions of the work (and the contract period) and some expansion work remaining to be finished.

Attached to this report are descriptions, excerpted from the FY90 and FY91 "Geology and Geophysics Program Summary" publications distributed by the Office of the Chief of Naval Research describing the status of the overall project "Fabrication of a NAVMAP, a Deep-Sea Mapping System," which includes both the grant and contract components of the effort. The second of these, at the end of FY91, describes the status after the transition from grant to contract. From inception, the project, under the grant and contract status, has been viewed as a single project, with the goal of designing and building a single seafloor mapping instrument; the completion of the contract portion, due to finish 12/31/93, will provide the complete overview of the project.

The initial \$450,000 of funds of the NAVMAP development project, provided under the present grant, provided the funds to initiate the design of the system electronics, and to assemble some of the specific hardware for integration into the sonar system, including the following key components:

1. Two computer workstations to serve as system control and display consoles;
2. Digital signal processor boards and development systems around which to build the sonar system's digital data acquisition system;
3. One computer workstation for software development and testing;
4. Various sensors, electronics components, testing equipment and design tools to begin the development of the various sonar subsystems.

Under the grant component of the development, we subcontracted with Scripps Institution of Oceanography for software for sonar system display, and in addition to the major engineering development effort by personnel in our Hawaii Mapping Research Group, we contracted with the University of Hawaii Engineering Support Facility and Research Computer Facility for development of hardware and software components of the project; all of these efforts continued under the contract portion of the project as well, and further specific subsystem development began in the latter stages under the contract component of the project.

STRONG STATEMENT
Approved for public release
Distribution Unlimited

93 8 27 11 8

93-20227

~~93 6 18 02 7~~

Initial development of the sonar system under this grant led to the current contract continuation; the basic sonar system and most of its supporting components have been delivered to NAVOCEANO (summer 1992). The system was used in successful field operations in 1992 (including approximately 100 days of work in the Atlantic Ocean and Norwegian Sea); final project status will be reported to ONR on completion of the contract performance period.

Accession For	
NTIS	CRA&I <input checked="" type="checkbox"/>
DTIC	TAB <input type="checkbox"/>
Unannounced <input type="checkbox"/>	
Justification <i>per ltr</i>	
By	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
<i>A-1</i>	

DTIC QUALITY INSPECTED 3

Fabrication of a NAVMAP, a Deep-Sea Mapping System

Alexander Shor
Hawaii Institute of Geophysics, SOEST
University of Hawaii at Manoa
Honolulu, HI 96822

Long-Range Scientific Objectives

To develop a reliable, high resolution sonar mapping system capable of both high speed shallow deployment and high resolution deep deployment, which is able to acquire simultaneous backscatter and bathymetric data across a wide swath of seafloor. In final configuration, the system should be capable of operating over fiber optic or coaxial towing cable, and electronics and computer acquisition systems should be capable of operating over a wide range of sonar frequencies, providing a versatile geophysical and survey capability from a wide variety of research platforms.

Present Objectives

To design and build an 11 (port) and 12 (stbd) kHz sonar system to be operated by the Naval Oceanographic Office, for delivery in Spring 1992. This system will, on delivery, be designed for vehicle operation at depths of 6,000 meters, and to be capable of mapping in all ocean depths. The system and a system of similar electronics design being built by University of Hawaii will be used to carry out Navy-funded field operations during FY92 and FY93.

Current Status and Progress

Prototype electronics and data acquisition system were essentially complete at the end of FY91, with field testing underway, and first field program using the new electronics and data acquisition system planned for early in FY92. Plans were made for delivery of vehicle hardware and deck equipment in order to meet delivery schedule of Spring 92.

Publications

There were no publications on this project during FY91. Abstracts and oral presentations were submitted for meetings in FY92, describing the new system and initial data acquired with it.

Fabrication of NAVMAP, a Deep-Sea Mapping System

Alexander N. Shor
Mark R. Rognstad

Hawaii Institute of Geophysics
University of Hawaii
2525 Correa Road
Honolulu, Hawaii 96822
(808) 956-7796

Long Range Scientific Objectives

The SeaMARC II seafloor mapping system, developed and built in 1982, has proven to be a valuable tool for the study of seafloor morphology. This prototype system simultaneously acquires both seafloor backscatter (sidescan sonar) and bathymetric data, and has been used worldwide by investigators throughout the academic and marine research communities in the U. S. and abroad. During FY'90, we have begun to design a new mapping system with enhanced capabilities, taking advantage of recent improvements in the state of the art of signal processing. The new system will be capable of mapping a larger area in less time and with greater precision and reliability. On conclusion of testing and trials, the new system will be operated by the U.S. Naval Oceanographic Office.

Project Objectives

The NAVMAP system will be similar to our present sonar system in several ways. It will operate at frequencies of 11 and 12 kHz, transmitting from a vehicle towed behind a survey vessel. The tow vehicle will house electronics for driving the transducer arrays, receiving and digitizing the reflected sound, and processing the data for transmission to the surface. There will be a number of differences, however, where the NAVMAP system incorporates improvements in design and additional capabilities. These include:

1. Increasing transmitter output to 10 kW per array row, for a total of 40 kW per ping. This more than doubles the output of SeaMARC II.

2. Utilize a powerful, RISC based workstation for data acquisition, towfish control, realtime display and data logging. Incorporated within the workstation will be a digital signal coprocessor, for handling time-critical communications with the subsurface system and for signal processing. The workstation will merge time and navigation information with sonar data, and be capable of transferring these data to other computers over a network.

Project Objectives (cont'd)

3. Digitize the received signals directly at four times transmit frequency rate (i. e., 44 and 48 kHz), and perform quadrature detection, filtering, spreading loss and attenuation correction, etc digitally.

4. Monitor voltage and current waveforms of transmitted signals, as a check on transmitter performance, and to establish spectral characteristics of the output sound.

5. On command, inject signals of well-defined, variable frequencies and amplitudes into the receiver electronics. This will permit performance monitoring and calibration of receiver system response.

6. Transmit a single, digital data stream to the surface electronics package, containing both amplitude information for backscatter imaging and phase angles for bathymetry calculation. The SeaMARC II transmits backscatter data via two analog SSB channels, and digital data over two digital FSK channels.

7. Vehicle and transducer design will allow operation to 6000 meters tow depth, providing both deep- and shallow-tow capabilities.

Present Status and Progress During the Current Year

Since receiving funding in July '90, specifications for the subsurface electronics were prepared and distributed to potential vendors, who were invited to bid.

A detailed specification for the entire system, including the FY'91 effort, was prepared and submitted to NAVOCEANO for comment and revision. One revision mentioned before year end was incorporation of an optical fiber tow cable into the system, and is presently under consideration.

The Sun Microsystems SparcStation 2 has been selected for use at the surface; an order has been placed for delivery in January '91. The digital signal coprocessor has also been selected: the DSP-S56X from Ariel/Berkeley Camera Engineering.

NAVMAP design and development will continue through FY'91, with full system tests planned for early FY'92.

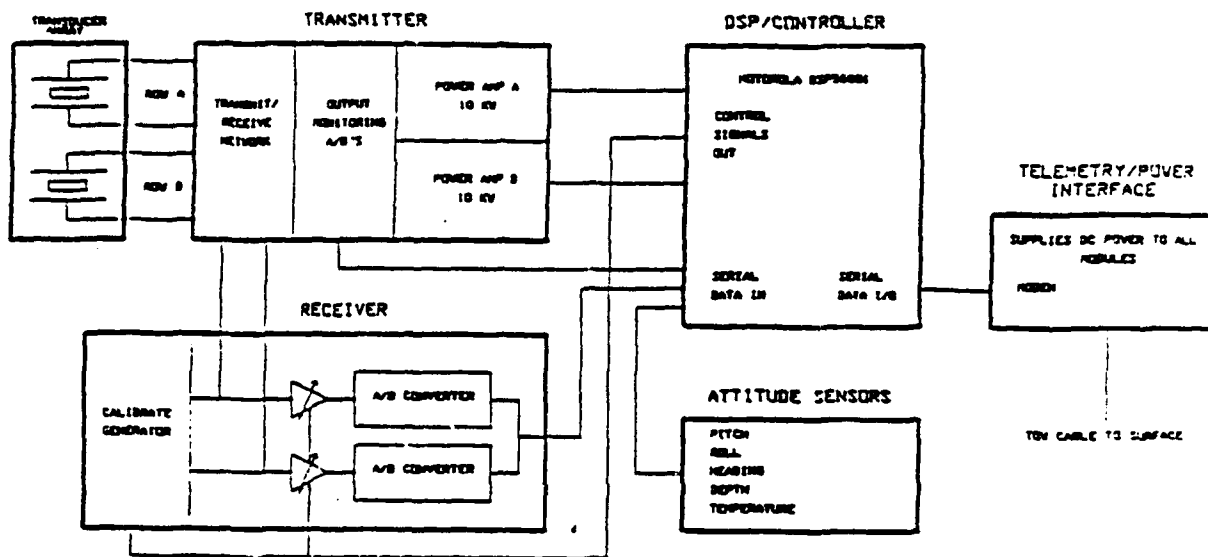


Figure 1. Subsurface Electronics Block Diagram.
Block diagram is for one side only; port and starboard are duplicates. Attitude sensors will be installed on one side only.

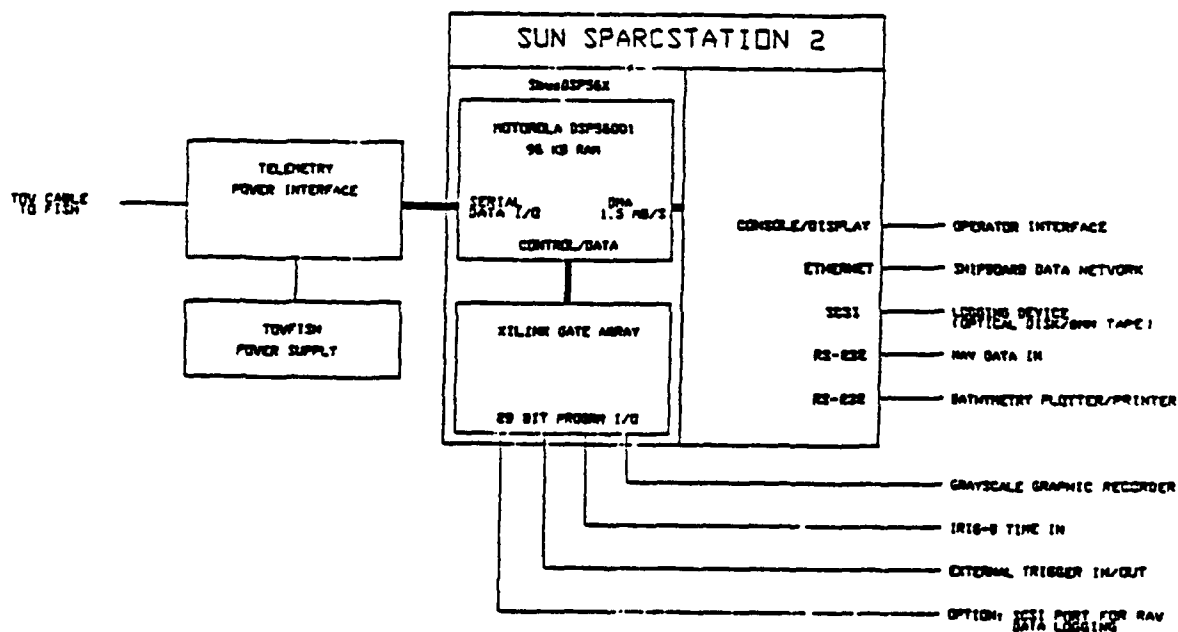


Figure 2. Surface Electronics Block Diagram

COPY AVAILABLE TO DTIC DOES NOT PERMIT FULLY LEGIBLE REPRODUCTION

10/8 To Judy.

FINANCIAL STATUS REPORT

(Short Form)

(Follow instructions on the back)

1. Federal Agency and Organizational Element to Which Report is Submitted U.S. Department of the Navy		2. Federal Grant or Other Identifying Number Assigned By Federal Agency N00014-90-J-4009		OMB Approval No. 0348-0039	Page 1	of 1
3. Recipient Organization (Name and complete address, including ZIP code) University of Hawaii 1380 Lower Campus Road, Building #171 Honolulu, Hawaii 96822						
4. Employer Identification Number 1-996000354A1		5. Recipient Account Number or Identifying Number F-93-2-4-F-402-2 000		6. Final Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		7. Basis <input checked="" type="checkbox"/> Cash <input type="checkbox"/> Accrual
8. Funding/Grant Period (See Instructions) From: (Month, Day, Year) 06/15/90		To: (Month, Day, Year) 12/31/91		9. Period Covered by this Report From: (Month, Day, Year) 06/15/90		To: (Month, Day, Year) 12/31/91
10. Transactions:				I Previously Reported	II This Period	III Cumulative
a. Total outlays				-0-	450,000.00	450,000.00
b. Recipient share of outlays				0-	-0-	-0-
c. Federal share of outlays				-0-	450,000.00	450,000.00
d. Total unliquidated obligations						-0-
e. Recipient share of unliquidated obligations						-0-
f. Federal share of unliquidated obligations						-0-
g. Total Federal share (Sum of lines c and f)						450,000.00
h. Total Federal funds authorized for this funding period						450,000.00
i. Unobligated balance of Federal funds (Line h minus line g)						-0-
11. Indirect Expense						
a. Type of Rate (Place "X" in appropriate box) <input checked="" type="checkbox"/> Provisional <input type="checkbox"/> Predetermined <input type="checkbox"/> Final <input type="checkbox"/> Fixed						
b. Rate 44.00%		c. Base 150 092 35		d. Total Amount 66 041.26		e. Federal Share 66,041.26
12. Remarks: Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.						
13. Certification: I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.						
Typed or Printed Name and Title MARVIN S. ENOKAWA Director-Contracts & Grants				Telephone (Area code, number and extension) (808) 956-7800		
Signature of Authorized Certifying Official				Date Report Submitted		

Previous Editions not Usable

Standard Form 289A (REV 4 88)
Prescribed by GMB Circulars A-102 and A-110

COPY AVAILABLE TO DTIC DOES NOT PERMIT FULLY LEGIBLE REPRODUCTION